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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/802,428	ZHANG ET AL.	
	Examiner	Art Unit	
	David N. Werner	2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) Responsive to communication(s) filed on 19 January 2010.
 2a) This action is **FINAL**. 2b) This action is non-final.
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) Claim(s) 1,3,5,7-17,19-25 and 27 is/are pending in the application.
 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
 5) Claim(s) _____ is/are allowed.
 6) Claim(s) 1,3,5,7-17,19-25 and 27 is/are rejected.
 7) Claim(s) _____ is/are objected to.
 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) The specification is objected to by the Examiner.
 10) The drawing(s) filed on 17 March 2004 is/are: a) accepted or b) objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) <input type="checkbox"/> Notice of References Cited (PTO-892)	4) <input type="checkbox"/> Interview Summary (PTO-413)
2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)	Paper No(s)/Mail Date. _____ .
3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.	5) <input type="checkbox"/> Notice of Informal Patent Application
	6) <input type="checkbox"/> Other: _____ .

DETAILED ACTION

1. This Office action for U.S. Patent Application 10/802,428 is responsive to the Appeal Brief filed 19 January 2010, in reply to the Final Rejection of 20 August 2009. Claims 1–3, 5, 7–15, 17, 19–25, and 27 are pending.
2. In the previous Office action, Claims 1–3, 5, 7, 10–15, 17, 19, and 22–25 were rejected under 35 U.S.C. § 103(a) as obvious over "Motion-based Segmentation Using a Thresholded Merging Strategy on Watershed Segments" (*de Smet*) in view of "K-Harmonic Means—A Data Clustering Algorithm" (*Zhang*). Claims 8, 9, 20, and 21 were rejected under 35 U.S.C. § 103(a) as obvious over *de Smet* in view of *Zhang* and in view of "A Video Segmentation Algorithm for Hierarchical Object Representations and its Implementation" (*Herrmann*). Claim 27 was rejected under 35 U.S.C. 103(a) as obvious over *de Smet* in view of *Zhang* and in view of U.S. Patent No. 6,084,912 A (*Reitmeier*).
3. In view of the Appeal Brief filed on 19 January 2010, PROSECUTION IS HEREBY REOPENED. New grounds of rejection under 35 U.S.C. §§ 101 and 103 are set forth below.

To avoid abandonment of the application, applicant must exercise of the following two options:

- (1) file a reply under 37 § CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR § 1.113 (if this Office action is final); or

(2) initiate a new appeal by filing a notice of appeal under 37 CFR § 41.31 followed by an appeal brief under 37 CFR § 41.37. The previously paid notice of appeal fee and appeal brief fee can be applied to the new appeal. If, however, the appeal fees set forth in 37 CFR § 41.20 have been increased since they were previously paid, then applicant must pay the difference between the increased fees and the amount previously paid.

A Supervisory Patent Examiner (SPE) has approved of reopening prosecution by signing below:

/Mehrdad Dastouri/

Supervisory Patent Examiner, Art Unit 2621

Response to Arguments

A. Claims 1–3, 5, 7, 10–15, 17, 19, and 22–25 were rejected under 35 U.S.C. § 103(a) as unpatentable over "Motion-based Segmentation Using a Thresholded Merging Strategy on Watershed Segments" (*de Smet*) in view of "K-Harmonic Means—A Data Clustering Algorithm" (*Zhang*).

1. Claims 1–3, 7, 10–12, 25.

Applicant makes two arguments regarding Claim 1: first, that the parameter $q(i,k)$ in the *Zhang* reference is not a "probability", as asserted in the previous Office actions, and second, "that a person of ordinary skill in the art would not have been prompted to

combine the teachings of" the *de Smet* and *Zhang* references. The first argument is persuasive and the second is not.

a) Membership probability

Applicant states that the parameter $q(i,k)$ in equations 6.2 and 7 of *Zhang* has a dimension of distance, and so cannot be a probability, which is inherently dimensionless. Applicant confirms that parameter $d(i,min)$ is a distance measurement. Upon further review of *Zhang*, it appears that the true probability function is $p(i,k)$, which is shown in equation 6.4 to be dimensionless. This is also confirmed in page 7, which calls $p(x|m)$ a "prior probability" and $p(m|I)$ a "mixing probability". *Zhang* is reinterpreted with $p(i,k)$ mapped with the claimed membership probability. This substantive re-interpretation of *Zhang* is considered a new ground of rejection. This Office action is non-final¹.

b) Reason to combine

Applicant states that due to "significant differences" between the claimed invention and the prior art references, one of ordinary skill in the art would not be motivated to combine their teachings. The examiner disagrees.

The *de Smet* reference was directed to a "motion-based image segmentation" based on a K-means clustering method. *De Smet*, § 4. *De Smet* noted that the K-

¹ The new claim rejections under 35 U.S.C. § 101 based on revised interpretation of *Nuijten* are also new grounds of rejection that make this action non-final.

means method could "perform quite well", particularly since it "distinguished the areas with smaller or different background motion". *Id.* *De Smet* concluded by inviting future improvements, such as replacing components with "various other techniques", and exploring "other regrouping and clustering strategies" with the possibility of "even better results". *Id.*

The *Zhang* reference describes the K-Harmonic Means clustering algorithm. *Zhang*, abstract. *Zhang* faults the K-means clustering method due to its sensitivity to the initialized positions of clustering centers. *Id.* The K-Harmonic Means method is specifically designed as an alternative clustering method to the K-means method, which improves on the K-means method by eliminating the problematic initialization sensitivity. *Id.*

In combining two prior art references to show obviousness under 35 U.S.C. § 103(a), "there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness". *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (U.S. 2007) (*quoting In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)). One of these rationales noted by the Supreme Court is "the application of a known technique to a piece of prior art ready for the improvement". *Id.* at 401. To use this test as a basis for rejection, an examiner must 1) find "that the prior art contained a 'base' device (method, or product) upon which the claimed invention can be seen as an 'improvement"'; 2) must find "that the prior art contained a known technique that is applicable to the base device (method, or product)"; 3) must find "that one of ordinary skill in the art would have recognized that applying the known technique would have

yielded predictable results and resulting in an improved system"; and 4) present "whatever additional findings based on the *Graham* factual inquiries may be necessary, in view of the facts of the case under consideration, to explain a conclusion of obviousness". MPEP § 2143(D).

In this case, 1) the *de Smet* reference contains a "base" method of motion segmentation in images, using the K means clustering method. 2) The *Zhang* reference contains the known K-Harmonic Means clustering technique. Since it is designed as an improved K-Means technique, as presented in *de Smet*, it is presumed to be applicable wherever the K-Means technique is, such as in motion segmentation. 3) Since the K-Harmonic Means clustering technique solves a specific known problem with the K-Means clustering technique: improper sensitivity to initialization, one having ordinary skill in the art would recognize the predictable results and the improved system in which the K-Harmonic Means technique replaces the K-Means technique, namely: greater freedom in setting uncertain initial values (or even random or evenly-spaced values) for clustering centers during initialization, with less concern over producing inaccurate clusters. 4) It does not appear that a formal inquiry into *Graham* is necessary, but the *Graham* factors will be briefly discussed. Regarding the scope and contents of the prior art, see the above discussion of *de Smet* and *Zhang* earlier in this paragraph.

Regarding the difference between the prior art and the claims, neither of the two prior art references individually disclose the claimed use of K-Harmonic Means for the application of motion trials, with *de Smet* using the old K-Means technique for this application and *Zhang* only giving a general, theoretical overview of the K-Harmonic

Means technique without details of applications. Regarding the level of ordinary skill in the art, this would be a high level of skill—higher than in most video processing patent applications due to the relatively abstract nature of the claims—but within the scope of the *de Smet* and *Zhang* references and the present application, there is no indication that any of these three documents is more difficult to comprehend than the other two. Regarding additional objective evidence, Applicant has not presented any evidence of secondary considerations.

Based on the facts presented within the prior art documents, there is no evidence in the record that the well-established "base plus improvement" test of obviousness was improperly used.

2. Claim 5.

Applicant's assertion against claim 5 is not persuasive. In the initial iteration of the recursive K-Harmonic Means algorithm of *Zhang*, every component of the algorithm is inherently initialized, including the regression function, as the result of the first iteration, as the values input as initialization center points cascade through the algorithm.

3. Claims 13–15, 19, 22–24.

Applicant does not argue Claim 13 and its dependent claims on their own merits, but merely as Claim 13 is analogous in scope with Claim 1. Examiner does not dispute Applicant's assertion that the motion estimation method described in the "wherein"

clause in Claim 13 is analogous to the method described in Claim 1. The examiner declines to discuss these claims further than what is already stated in the Final Rejection and the discussion of Claim 1 in § A.1.

4. Claim 17.

Applicant correctly asserts that Claim 17 is analogous in scope with Claim 5. The examiner's response to the argument against Claim 5, presented in § A.2., is fully incorporated as applicable to Claim 17.

B. Claims 8, 9, 20, and 21 were rejected under 35 U.S.C. § 103(a) as unpatentable over *de Smet* in view of *Zhang* and further in view of "A Video Segmentation Algorithm for Hierarchical Object Representations and its Implementation (*Herrmann*).

1. Claims 8, 9, 20, 21.

Applicant does not argue Claims 8, 9, 20, and 21 on their own merits, but merely as dependent on their base claims.

C. **Claim 27 was rejected under 35 U.S.C. § 103(a) as unpatentable over de Smet in view of Zhang and in view of U.S. Patent No. 6,084,912 (Reitmeier).**

1. **Claim 27.**

Applicant argues Claim 27 is allowable both as analogous in scope with Claim 1, discussed above in § A.1., and on its own merits. Applicant states that since *Reitmeier* discloses a "video coder", the examiner erred in relying on this prior art to teach a general purpose computer, as examiner interpreted the means-plus-functions claim language in view of the specification under 35 U.S.C. § 112, ¶ 6.

In the Final Rejection, examiner relied on col. 2: lines 64–67 of *Reitmeier* as disclosing the claimed general-purpose computer. This section of *Reitmeier* reads: "In fact, the video encoder can be implemented as a software application residing in the memory of a general purpose computer (not shown) or stored within a storage medium, e.g., a disk". Applicant fails to specify 1) how this section of *Reitmeier* does not or cannot disclose the claimed general purpose computer despite its plain meaning to the contrary; or 2) why the examiner erred in interpreting Claim 27 under 35 U.S.C. § 112, ¶ 6 as directed to a general-purpose computer, such as by presenting a preferred alternative interpretation in the specification. Applicant has not met its burden in overcoming the *prima facie* case of obviousness with respect to *Reitmeier*, and so, the rejection of Claim 27 is sustained, incorporating the new interpretation of *Zhang*.

Claim Rejections - 35 USC § 101

4. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

5. Claims 1–3, 5, and 7–12 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Current Office policy requires that the phrase "non-transitory" be added to and the word "storage" be removed from all *Beauregard* claim preambles. See "Subject Matter Eligibility of Computer Readable Media", 1351 Off. Gaz. Pat. Office 212 (February 13, 2010).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1–3, 5, 7, 10–15, 17, 19, and 22–25 are rejected under 35 U.S.C. 103(a) as being unpatentable over "Motion-based Segmentation Using a Thresholded Merging Strategy on Watershed Segments" (*de Smet*) in view of "K-Harmonic Means—A Data Clustering Algorithm" (*Zhang*). *De Smet* discloses using an iterative segment-merging technique to determine information for an image (abstract).

Regarding claims 1, 13, and 25, in *de Smet*, an initial motion field is first determined with a block-matching technique on 4 x 4 blocks. *De Smet*, § 2.1. These initial block motion vectors are used for the initial segmentation. *Id.* at § 2.3. Then, the step of performing the block-based motion estimation is the claimed step of "providing

data points". Next, the segments are iteratively merged according to similar or shared motion, according to the K-means clustering algorithm. *Id.* This is the claimed step of "clustering the data points". When this process is finished, the result is a series of large segments corresponding to distinct moving regions of an image, each with an associated motion vector. *Id.* This is the claimed step of "providing motion estimation". However, the present invention specifies performing regression clustering according to a K-Harmonic Means function, which is not the same as the K-means function of *de Smet.*

Zhang discloses the K-Harmonic Means data clustering algorithm. Regarding claim 1, 3, and 25, *Zhang* teaches selecting K centers $m(l)$ from N data points $x(i)$ (pg. 1), initializing center points (pg. 2) and performing an initial iteration (pg. 5), and calculating distance $d(i,l)$ between data point $x(i)$ and center point $m(l)$ (pg. 4), calculating membership probability $p(i,x)$ based on the distance via parameters $q(i,k)$ and $q(i)$ (pg. 5), and stopping when the recursively-calculated performance value stabilizes, that is, when its change with each iteration becomes small (pg. 5). Then, the K calculations of centers $m(l)$ are the claimed "regression functions" for performing regression clustering according to the K-harmonic means function. The calculation of each iteration of the recursive function is the claimed recalculation based on the membership probability, as $m(k)$ is dependent on probability function $p(i,k)$. The stabilization is the claimed "stopping criterion".

De Smet et al. discloses the claimed invention, except for using K-Harmonic Means function to perform regression clustering. *Zhang et al.* teaches that it was known

to perform data clustering with the K-Harmonic means function. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to perform clustering based on a K-Harmonic means function, as taught by Zhang et al., rather than a linear function such as the K-means function of de Smet et al., since Zhang et al. states in the abstract that K-harmonic clustering is less sensitive to detrimental effects from sub-optimal initialization than conventional clustering techniques. Additionally, the K-harmonic means function was specifically designed as an improved version of the K-means function, which "significantly improves the quality of clustering results" compared with K-means (abstract). Then, the de Smet et al. algorithm contains a basic method which the present invention is an improvement thereof. The prior art Zhang et al. describes a known technique, the K-Harmonic means clustering algorithm, applicable to the base segmentation method of de Smet et al., by substituting it for the K-means algorithm. Then, one having ordinary skill in the art would have recognized that applying the K-harmonic means algorithm of Zhang et al. to de Smet et al. would have yielded the predictable result of "significantly [improved] quality of clustering results" and resulted in an improved system. Therefore, it is respectfully submitted that the use of K-harmonic clustering in de Smet et al. is considered obvious, since it has been held that applying a known technique to a known method ready for improvement to yield predictable results involves only routine skill in the art. *Dann v. Johnston*, 425 U.S. 219, 230, 189 USPQ 257, 261 (1976); *In re Nillsen*, 851 F.2d 1401, 1403, 7 USPQ2d 1500, 1502 (Fed. Cir. 1988).

Regarding Claims 2, 3, 14, and 15, as previously mentioned, *de Smet* produces a motion vector for each segment in an image. *De Smet*, § 2.3. As a result, the most important moving areas are determined. *Id.* at § 3. This is the claimed production of motion vectors and at least one motion path.

Regarding Claims 5 and 17, in *Zhang*, a clustering in which initialization is randomized is described (pg. 11). Since Applicant admits in page 10 of the 19 January Appeal Brief that this initialization is an initialization of the algorithm as a whole, it inherently contains an initialization of the regression function.

Regarding Claims 10 and 12, in *de Smet*, pixels are set as (x, y, t) triples, with x and y as spatial coordinates and t as a time coordinate. *De Smet*, § 2.2.

Regarding Claims 11 and 23, *de Smet* illustrates motion fields. *De Smet*, figs. 3–6. Although these motion fields are not shown as overlaid on the images, the examiner takes Official Notice that it was well-known in the art at the time of the invention to display a motion field superimposed on an image to provide a visual representation of motion vectors.

Regarding Claims 12 and 24, *de Smet* illustrates highlighted motion segments overlaid on an image. *De Smet*, figs. 11, 12.

8. Claims 8, 9, 20, and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over *de Smet* in view of *Zhang* as applied to claims 1 and 13 above, and further in view of "A Video Segmentation Algorithm for Hierarchical Object Representations and its Implementation" (*Hermann*). Claims 8, 9, 20, and 21 disclose

using color information to segment techniques, but *de Smet* only discloses "standard watershed techniques" to perform initial segmentation without providing details. *De Smet*, § 2.2.

Hermann discloses a method for image segmentation to extract objects from a moving image. Regarding Claim 8, 9, 20, and 21, after an initial block-matching motion estimation, similar to that in *de Smet*, images are segmented according to specific color information, followed by shape analysis, and lastly motion analysis to merge regions to determine objects. *Hermann*, § II. This color, shape, and motion information form the claimed "predetermined criteria". In color analysis, a region is determined as homogeneous if the pixel difference in the region is below a threshold. Homogenous, connected areas are determined as "quasi-flat zones". These quasi-flat zones are further processed and become the basis for further segmentation. *Id.* at § II.B. Then, the color analysis is the claimed step of "portioning data according to color".

De Smet, in combination with *Zhang*, disclose a majority of the features of claims 8, 9, 20, and 21 of the claimed invention, as discussed above, except for color segmentation. *Hermann* teaches that it was known to segment a moving image according to color. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to determine image segmentation by color as taught by *Hermann*, since *Hermann* teaches in p. 205, ¶ 3, that color analysis produces the most accurate type of segmentation.

Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over *de Smet* in view of *Zhang* and in view of U.S. Patent 6,084,912 A (*Reitmeier*). Claim 27 is in means-plus-function format, complying with 35 U.S.C. 112, ¶ 6. Accordingly, the “system” of claim 27 will be limited to a general-purpose computer such as a PC, as illustrated in figure 5 of the specification of the present invention. Although it is implied that the algorithms of *de Smet* and *Zhang* are computer-operated, neither *de Smet* nor *Zhang* explicitly teach this.

Reitmeier discloses a video encoder. This encoder may operate on MPEG-4 video (col. 1: line 57), as specified in ¶¶ 6, 7 of the present invention as a codec on which the present invention is applied. Regarding Claim 27, the encoder of *Reitmeier* may operate as a software application on a general-purpose computer. *Reitmeier*, col. 2: lines 64–67.

De Smet, combined with *Zhang*, discloses the claimed invention except for encoding video on a general-purpose computer. *Reitmeier* teaches that it was known to implement an MPEG-4 encoder as software embedded on a computer. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to encode the system of *de Smet* and *Zhang* in a software MPEG-4 encoder embedded on a computer, as taught by *Reitmeier*, in order to perform computationally complex functions such as motion compensation, quantization, and variable-length encoding inherent in the video coding process.

Conclusion

9. Examiner formally requests an interview with Applicant's Representative prior to the written reply to this Office action. Proposed topics of discussion include the support for the claimed regression function in the specification, Applicant's interpretation of equations 6.1–6.5 in the *Zhang* reference, and any difference between the presently-disclosed K-Harmonic Means function and the K-Harmonic Means function as presented in the *Zhang* reference.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David N. Werner whose telephone number is (571)272-9662. The examiner can normally be reached on Monday-Friday from 8:30 to 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mehrdad Dastouri can be reached on (571) 272-7418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

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/D. N. W./
Examiner, Art Unit 2621

/Mehrdad Dastouri/
Supervisory Patent Examiner, Art Unit 2621